The comparative effect of farnesol and antibiotics against *Staphylococcus epidermidis*

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Introduction:

Staphylococcus epidermidis is one of the main causes of medical device-related infections owing to its adhesion and biofilm-forming abilities on biomaterial surfaces. Farnesol is a sesquiterpenoid produced by many organisms, and also found in several essential oils. Studies revealed that farnesol affect the growth of a number of bacteria and fungi, pointing to a potential role as an antimicrobial agent. In this work we evaluated the role of farnesol on *S. epidermidis* growth and compared the effect of farnesol with the effect of various antibiotics on planktonic and biofilm cells of *S. epidermidis*.

Methods:

A 24 h kinetic study was performed using vancomycin, tetracycline and rifampicin at the peak serum concentration and farnesol at concentrations of 30, 100, 200 and 300 microM. The growth inhibition effect of the antimicrobial agents on planktonic and biofilm cells of *S. epidermidis* were assessed by XTT (the reduction of this tetrazolium salt is a measure of cellular activity and is easily assessed by colorimetry), Crystal Violet (only for biofilms), which measures total biomass of biofilm and Colony forming units (CFU). The biofilm cells were also analysed by confocal laser scanning microscopy after being stained with Live/Dead.

Results:

On planktonic cells, 300 microM of farnesol seems to have an inhibitory effect after 8 hours of agent exposition causing a reduction of 1.5 log on CFU. However after 24 hours the planktonic cells seem to recover. Over time, tetracycline and vancomycin caused a progressive reduction of CFU of 2 and 3 log, respectively. Rifampicin caused a reduction of 0.5 log after 6 hours. After that the CFU increase gradually until 24 hours. In comparation with the antibiotics tested, after 8 hours of exposition to the antimicrobial agents, 300 microM of farnesol has a similar effect of vancomycin and tetracycline. Rifampicin was the antimicrobial agent less effective against those cells. After 24 hours farnesol is less effective than vancomycin and tetracycline, but more effective than rifampicin.

On biofilms, vancomycin and tetracycline do not have any effect on CFU. After 24 hours, rifampicin provoked a reduction on CFU of 1 log. 300 microM of farnesol provoked a gradual increase of CFU until 8hours. After that and until 24 hours, farnesol caused a reduction of CFU of 2 log. Until 8 hours farnesol has a similar effect of vancomycin and tetracycline. After 24 hours farnesol seems to be more effective than the former antibiotics and as effective as rifampicin.

Conclusions:

Since antibiotics are usually administrated every 8-12 hours, farnesol may be used as an alternative to antibiotics in the treatment of *S. epidermidis* systemic infections. It can also be used in chronic infection provoked by biofilm cells because farnesol is as or

more effective than the antibiotics tested.